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EDITORIAL

Is workload associated with injuries and performance in elite football? A call for action

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In Search of the Holy Grail

What would a Premier League team pay for software that allowed it to optimize performance while reducing injuries? There are emerging data that would allow such software to be developed (and indeed, some software companies who already claim they can predict injuries before they occur), but the product is not ready for prime time yet. In this editorial, we briefly 1) direct the reader to data showing how workload is associated with injuries, 2) highlight the challenges in training and match load monitoring, and 3) call for a consensus meeting to agree on the variables to be used to assess training and match load in football (soccer).

What We Know

To date, few studies have assessed the effect of decreased recovery days between matches (i.e. fixture congestion), as an index of match load, on injury and performance. Running performance itself appears unaffected by fixture congestion (1, 2) but injury rates may be higher (1) or similar (2) when playing 2 matches in a week compared to playing 1 match per week. Is this due to tactics or to players' pacing?

With regards to the first point, tactics may prevent football players from exploring their full physical potential and hence from overloading their body during matches (3). For instance, match analysis using GPS has shown that peak match speed is about 87% of maximal sprinting speed obtained in a sprint test and differs by playing position (about 94% for strikers and 85% for central midfielders) (3). Although the data are from youth players, they support the hypothesis that highly trained players use only a proportion of their physical potential due to contextual factors (i.e. tactics, opponents, weather, their expectations, etc). Regarding the pacing hypothesis, it is speculated that players pace themselves to preserve key performance indicators (4). For example, while playing football in the heat, players cover less high-intensity distance but improve the rate of successful passes and maintain their peak running speed (4). These points might have an impact on the interpretation of the workload and injury relationship in high level football players.

There are very few data documenting the relationship between training load, injury rates and performance in elite level football players. Data from other team sports, like rugby, show that an abrupt increase in training load, in the order of more than 10% from the previous week, is associated with an elevated risk of non-contact injury (5). In transferring rugby data to football, it is likely we miss something. This is because the nature of the game affects the relationship between workload and injuries. For instance, rugby demands an

aggressive approach and match performance is heavily reliant on the physical components. In football, match running performance plays a small role and tactics are of major importance.

Do We Measure What We Claim to Measure?

Despite the introduction of new technologies and methods to monitor training load, there has been no reduction in the incidence of muscle injuries over the period 2001-12 in high level footballers. Moreover, the number of training hamstring injuries increased by 4% annually between 2001 and 2014 (6). Part of the confusion might be the tools we use to monitor training load.

At the elite level, external training load (e.g., volume of running) is assessed using a plethora of variables (7). In high-level football clubs the top 4 preferred external training load variables were: acceleration, total distance, distance covered at speeds above 5.5 m/s, and estimated metabolic power (7).

Internal training load (perception of work) is mainly assessed with the rate of perceived exertion (RPE). The accuracy of the RPE-based method is questionable given 1) it is only moderately correlated to some external training load variables, and 2) it is affected by previous and next match contextual factors (8). In addition, players may be unwilling to report fatigue which might prevent them from being available for selection. All of these concerns should be taken into account when developing a strategy to assess training and match load.

Talk is Cheap – It's Time for Action!

To shed light on the interaction of workloads and injuries, we propose two actions:

- 1) Team strength and conditioning staff should implement more objective assessments of player's physical capacity and readiness to play, and we should move towards assessing the outcome of training.
- 2) We call for a consensus meeting with experts in the field to review the existing literature and provide evidence-based recommendations on the monitoring of training and match load, their interaction and their association with injuries and performance in high level football.

It's time for action!

Competing interests: None declared

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